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Petroleum, petrochemical and natural gas industries — Shell-and-tube heat exchangers

Industries du pétrole, de la pétrochimie et du gaz naturel — Échangeurs de chaleur à faisceaux

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

This third edition cancels and replaces the second edition (ISO 16812:2007), which has been technically revised.

This document supplements API Std 660, 9th edition (2015).

The technical requirements of this document and API Std 660 used to be identical. In the meantime API Std 660 has been technically revised as API Std 660, 9th edition (2015). The purpose of this document is to bring it up to date, by referencing the current edition of API Std 660 and adding supplementary content.

The main changes compared to the previous edition are as follows:

— Improved guidance on cyclic service and sour service;

— The minimum bend for ‘U’ tubes when using stainless steel, duplex, etc., increased;

— Minimum requirements added when using inlet impingement rods;

— Limitations on the use of threaded connections extended to wet hydrogen sulfide services;

— Nozzle reinforcement pads not to be used “in cyclic service, hydrogen service with operating temperatures above 230 °C (450 °F), or other services with operating temperatures above 400 °C (750 °F)”;

— A new optional section added for girth flange joint design for hydrogen, cyclic services, high temperature or pressure, etc. This is additional to other requirements related to improved girth flange design;

— Gasket requirements enhanced;

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— New materials section added for requirements for carbon steel in sour or wet hydrogen sulfide service;

— Heat treatment requirements expanded;

— Extensive increase in section on quality assurance;

— Recommended practice clauses expanded.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Users of this document are informed that further or differing requirements can be needed for individual applications. This document is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor needs to identify any variations from this document and provide details.

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Petroleum, petrochemical and natural gas industries — Shell-and-tube heat exchangers

1 Scope

This document specifies requirements and gives recommendations for the mechanical design, material selection, fabrication, inspection, testing and preparation for shipment of shell-and-tube heat exchangers for the petroleum, petrochemical and natural gas industries.

This document supplements API Std 660, 9th edition (2015), the requirements of which are applicable with the exceptions specified in this document.

This document is applicable to the following types of shell-and-tube heat exchangers: heaters, condensers, coolers and reboilers.

This document is not applicable to vacuum-operated steam surface condensers and feed-water heaters.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15156 (all parts), *Petroleum and natural gas industries — Materials for use in H2S-containing environments in oil and gas production*

ISO 17945, *Petroleum, petrochemical and natural gas industries — Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments*

ISO 23251[1)], *Petroleum, petrochemical and natural gas industries — Pressure-relieving and de-pressuring systems*

API Std 660, *9th edition (2015), Shell-and-tube heat exchangers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in API Std 660, 9th edition (2015) and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
effective heat transfer area
effective surface
outside surface area of the tubes that contributes to heat transfer including finned surface (if any)

[SOURCE: API Std 660, 9th edition (2015), 3.6, modified — Admitted term was added.]

Note 1 to entry: “Effective surface” is equivalent to 3.6 in API Std 660, 9th edition (2015). It is reproduced here for clarity.

1) Under preparation. Stage at the time of publication: ISO/FDIS 23251:2018.

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